International Journal of Scientific Research in Engineering and Management (IJSREM)
Volume: 05 Issue: 04 | April - 2021 ISSN: 2582-3930

MACHINE LEARNING BASED FIRE RECOGNIZATION IN LIVE VIDEO STREAMING USINS SUPPORT VECTOR MACHINE

Naveen Kumar K[1], Ramkumar M[2], Robinson B[3], Rameshkumar M[4]
[1, 2, 3] Dept of Computer Science and Engineering
[4] Assistant Professor, Dept of Computer Science and Engineering
[1, 2, 3, 4] Adhiyamaan College of Engineering, Hosur, India.

ABSTRACT- *In general, the smoke sensors are the most widely used devices to detect fires. Smoke sensors can detect fire only if the fire is large enough to produce smoke. Therefore, a system that can detect fire at early stages is needed to take required timely action to prevent damages that can happen due to fire. In this project, a new method is proposed to detect fire and flame in video sequences by processing the data recorded using a common camera monitoring a large or open space. Flame flickering process is modeled by means of two kinds of feature representations. One is the pixel color value variation, and the other is the contour shaping information with time. Both of these temporal cues provide discriminating power of fire regions. First, combined the motion detection and color detection of the flame as the fire preprocessing stage. Second, although the flame is irregular, it has a certain similarity in the sequence of the image. Then, extracted features including spatial variability, shape variability, and area variability of the flame to improve the accuracy of recognition. Finally, used support vector machine(SVM) for training, completed the analysis of fire images, and achieved automatic fire detection. Further the system if fire is detected the image will capture and send to mail alert by using SMTP protocol. Experimental results showed that the proposed method could improve the accuracy and reduce the false alarm rate compared with a state-of-the-art technique. The method can be applied to real-time camera monitoring systems, such as home security, forest fire alarms, and commercialmonitoring.*

I. INTRODUCTION

The purpose of the project is to solve the existing problem of unreliable fire detection systems used in industrial warehouses. The project is aimed at using surveillance cameras in order to detect and monitor the occurrence of fire. Since the cameras are already installed in places, this system is aimed at diminishing the disadvantages of false alarm, making the system cost effective and fast method of detecting fire. The system uses Open Source Computer Vision, also known as Open CV, is an open source freeware which is aimed at computer vision. In warehouses, a surveillance network consisting of cameras exist due to security and insurance needs. Warehouses usually also contain an expensive hazard detection system consisting of fire detection and smoke detection devices. These devices may or may not be too reliable in case of a fire. Also, these devices cause plenty of false alarms due to cigarette smoke or incense smoke etc. This led us to developing an algorithm which could be using the already existing surveillance system so as to detect fire from a live video feed by processing it. This also reduces the cost of purchase and maintenance of the expensive and unreliable fire detection systems. Our proposed system provides fire detection using a SVM algorithm. It is as described below. Firstly, the image frame is acquired from the live video feed. The RGB color model is then applied to the frame. The resultant passed through thresholding, median blurring (to remove noise), Background Subtraction, Sobel edge detection, and motion detection windows. The resultants of all these are then combined using Bitwise AND operation. Segmentation techniques are applied on this resultant to produce the finalresult, i.e. detection of the absence or presence of fire in the frame. A suitable response is displayed on the window monitor, and fire image can be captured and send to mail alert by using

SMTP protocol. Experimental results show that our system is effective for various fire-detection tasks in real-world environment settings.

II. LITERATURE REVIEW

Fire is an undesirable event that could bring a great loss of social wealth and human life. To prevent these losses, various alarm systems have been developed such as smoke detectors, temperature sensor based systems etc. As technologies evolved and instruments such as temperature sensors, camera etc. becomes affordable, various automated fire alarm systems are now available. In conjunction with the cheaper instruments, internet based and wireless broadband technologies, have also improved and there are now various systems that enables cheap, high rate data transmission and wireless networking.

A Fire Detection System is number of devices working together to detect and warn people through visual and audio appliances when smoke, fire, carbon monoxide or other emergencies are present. The proposed fire detection system is a real-time monitoring system that detects the presence of fire and captures images via a web camera installed inside a room when a fire occurs [4].

The availability of cheap credit card sized single board computer such as the Raspberry Pi has enabled the creation of numerous automated and monitoring system that has low power consumption, faster processing ability at a lower cost. The fire detection system proposed in this project integrates the use of affordable instruments, connectivity and wireless communication [6].

Normally the input is in RGB form, and then RGB form is converted to HSV form. Then the range representing HSV form of fire is applied to detect only fire characteristics. Fire in HSV form is then displayed. HSV color space is chosen purposely because it has ability to differ illumination information from chrominance more effectively than the other color spaces. Threshold values for the fire are loaded in to the system, as par the threshold values color detection system display result only if the fire is detected [8].

This algorithm combines statistical background image estimation and per- pixel Bayesian segmentation. It uses first few (120 by defaulT) frames for background modelling. It employs probabilistic foreground segmentation algorithm that identifies possible foreground objects using Bayesian inference. The estimates are adaptive; newer observations are more heavily weighted than old observations to accommodate variable illumination. Several morphological filtering operations like closing and opening are done to remove unwanted noise. You will get a black window during first few frame.

III. EXISTING SYSTEM

Existing systems include Fire and Hazard Detection systems which employ heat sensors or temperature sensors or smoke sensors or a combination of these. These are installed at heights which are usually floor level (or ceiling level). These contain individual sensors which are not lined together, which leads to unpredictability and non-synchronous behavior of alarm. A smoke detector is a device that senses smoke, typically as an indicator of fire. Fire alarm system known as smoke alarms, generally issue a local audible or visual alarm on detection of smoke.

IV. PROPOSED SYSTEM

The proposed fire detection algorithm using open cv. The algorithm can be used in parallel with conventional fire detection systems to reduce false alarms. It can also be deployed as a stand-alone system to detect fire by using video frames acquired through a camera device. The proposed fire color model is tested with ten diverse video sequences including different types of fire by using support vector machine(SVM) algorithm. The experimental results are quite encouraging in terms of correctly classifying fire pixels according to input image. If fire is detected the image is captured and send email alert by using SMTP protocol.

V. SYSTEM FUNCTION

ARCHITECTURE DESIGN

The input video data to extract the RGB and HSV values from the video and it follows the threshold values truly for the function and it goes to the video capture and it waits for the response. When comparing to the xml data set it supports the vector machine along with the region of index and the guassian filter to the contour mapping SMTP protocol.

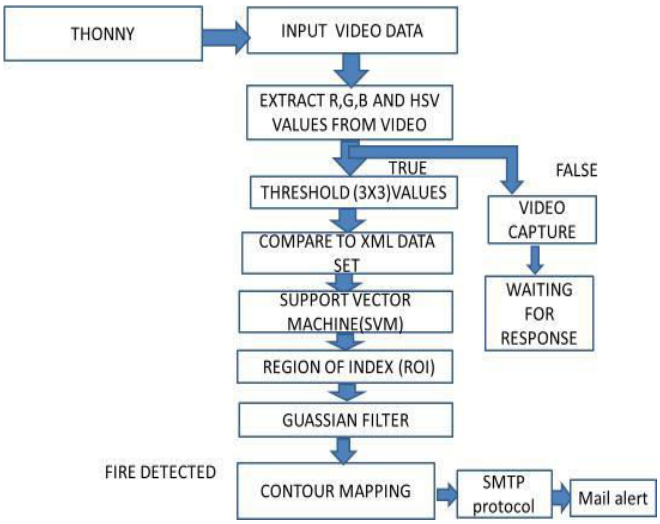

Figure 1 Architecture design for Proposed System

SYSTEM MODULES

There are five modules are used in this project

- Video capturing module
- Segmentation module
- Fire pattern recognition module
- Contour mapping module
- Mail alert module
- **Video capturing module-:** Video capture with the help of pc camera is the first module of our system design. In this module the camera captures continuous frames from the area of its coverage. All the captured images or frames transfer to the software for applying image processing function.
- **Segmentation module-:** Second module is Color based segmentation in this module after separating the frames as single image it is subjected to standard color base segmentation. The segments are further divided into constant sizedblocks.
- **Fire pattern recognition module-:** Third module is Fire pattern recognition in this module the blocks of the segmented image will be examined for the presence of heat signature or fire patterns by using SVM algorithm.
- **Contour mapping module-:**in this module the detected fire is mapping and showed.
- **Mail alert module-:** if fire is detected and the fire image is capture and sendto mail alert.

VI. CONCLUSION

The most important goals in fire surveillance are Real time, quick and reliable detection and localization of the fire is achieved by open cv and machine learning which provides the real time image processing. Thus, the proposed project aims to detect fire occurrence while it is in its early stages so that it is much easier to suppress a fire and prevent loss of property and invaluable human lives.in this project if fire is detected the image will capture and send to mail alert for preventing fire accident.

REFERENCES

[1] Anil K.Jain , **"**Fundamentals of Digital Image Processing**"**, Pearson Education.

[2] Ali Rafiee, Reza Dianat, MehreganJamshidi, Reza Ta vakoli and Sara Abbaspour, **„** Fire and Smoke Detection Using Wavelet Analysis and Disorder **Characteristics", IEEE** Conf.

[3] Bo-Ho Cho, Jong-Wook Bae, and Sung-Hwan Jung , **„**Image Processing Based Fire Detection System Using Statistic Color **Model", IEEE** Conf.

[4] C. Emmy Prema1 and S. S. Vinsley , **„**Image Processing Based ForestFire Detection using YCbCr Colour **Model", IEEE** Conf

[5] Giovanni Laneve, Marco M. Castronuovo, and Enrico G. Cadaul, **„**Continuos Monitoring Of Forest Fires In The Mediterranean Area Using **MSG", IEEE** Conf

[6] Guodong Li1, Gang Lu and Yong Yan, **„**Fire Detection using Stereoscopic Imaging and Image Processing **Techniques", IEEE** Conf.

[7] Hideaki Yamagishi and Jun'ichi Yamaguchi , **„**A Contour Fluctuation Data Processing Method For **Fire Flame Detection Using A Color Camera",** IEEE Conf, Technical Research Laboratories, Sogo Keibi Hosho Co., Ltd.JareeratSeebamrungsat,

[8] Suphachai Praising, and PanomkhawnRiyamongkol, Fire Detection in the Buildings Using Image **Processing",** IEEE Conf. Kenny KalVinToh, Haidi Ibrahim and Muhammad NasiruddinMahyuddin,**„**Salt-and Pepper Noise Detection and ReductionUsing Fuzzy Switching Median **Filter", IEEE** Transactions on Consumer Electronics.

[9] Kosmas Dimitropoulos, Panagiotis Barmpoutis and Nikos Grammalidis,**„**Spatio-Temporal Flame Modeling and Dynamic Texture Analysis for AutomaticVideo Based **Fire Detection", IEEE** Conf

[10] Li Jinghong, LvRiqing, Zou Xiaohui , **„**Design And Research Of Video Fire Detection System Based On **FPGA", IEEE** Conf.

[11] Milan Sonka, ValclavHalavac and Roger Boyle , **"**Image Processing, Analysis and Machine Vision**"**, 2nd Edition, Thomson Learning.

[12] Ping-He Huang, Jing-Yong Su, Zhe-Ming Lu and Jeng-Shyang Pan, „A Fire- Alarming Method **Based on Video Processing", IEEE** Conf.

[13] Rafael C.Gonzalez and Richard E.Woods , **"**Digital Image Processing**"**, 2nd Edition, Pearson Education.

[14] TjokordaAgung Budi W and IpingSuprianaSuwardi , **„**Fire Alarm